REPORT ON THE

INLET SWAMP Drainage District

PREPARED BY

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REMOTE STORAGE

LETTER OF TRANSMITTAL

OFFICE OF A. M. SHAW,
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105 FIRST STREET

Dixon, Ill., May 16, 1908.

MESSRS. E. L. TITUS,
X. F. GEHANT and
CLARK BUTLER, Commissioners,
Inlet Swamp Drainage District.

GENTLEMEN:

We hand to you herewith our report on the Inlet Swamp Drainage District which includes our recommendations covering work to be done together with a detailed statement of the cost of same. Accompanying this report is a plat of the district and profiles of all laterals for which any considerable increase in depth or width has been recommended.

Respectfully submitted,
A. M. SHAW,
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REPORT

ON THE

INLET SWAMP Drainage District

With description of the works necessary for the complete drainage of the district

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The Inlet Swamp Drainage District comprises an area of about forty-seven square miles and forms a part of the townships of Alto, Willow Creek, Reynolds, Viola, Bradford and Lee Center with a right of way extending a short distance into Amboy township, all in Lee County, Illinois. The total area of all lands draining into the system of ditches as now established amounts to one hundred and seventy-nine square miles, though only one hundred and fifty square miles of this territory is tributary to the system above the village of Inlet, which is situated at the outlet of the original Inlet swamp. For the sake of brevity, the lands of the Inlet Swamp Drainage District will be referred to herein as the "district" while those of the larger area considered which includes all lands draining into the ditches of the district, will be referred to as the "drainage area."

The general direction of the inclination of the surface of the lands in the outer portions of the district is toward the center and this inclination amounts to from one to twelve feet to the mile. In the central part of the district is an area of about ten square miles which has an almost imperceptible slope toward the southwest. This tract will be referred to herein as the "flat area." A typical section of the soils of the district shows a top layer of vegetable loam on a subsoil of clay. Under this is found a deposit of coarse sand or sandy gravel. These strata are of varying thickness but may be found in the above order in practically all por-

tions of the district. The outlying portions of the drainage area present a greater variety of soil conditions though along the northern boundary, they are much the same as within the district. The slope of the lands of nearly all of Reynolds township is very flat, the division between the water shed of the Inlet Swamp system and that of the Brush Grove system to the north being quite indistinct. On the east the soils are much the same as within the district but the surface is much more rolling. On account of their steep gradient the streams have in most cases worn their beds down into the gravel subsoil. The lands to the south are sloping or rolling and are largely made up of heavy soils though much of those immediately adjoining the district have a top soil of fine wind laid sand.

The original outlet for the above drainage area was through a slight channel which had been worn through the outcrop of hard limestone at Inlet. This rock was the barrier to the natural drainage of the Inlet swamp and has been the principal obstacle to all efforts that have been made for the drainage of the district. At various times since the district was organized (on August 5, 1887) this rock channel has been increased both as to depth and width but as shown by the following, the channel thus increased is still inadequate. The Inlet barrier extends for about half of a mile west. Beyond this no rock is encountered for another half mile. From the mouth of the creek entering the main ditch about three-quarters of a mile below Inlet to the end of the last work at Binghampton, more or less rock was encountered in the bottom of the ditch as shown by the accompanying profile, but a large proportion of former work in this rock was done without blasting. Borings have been taken at various intervals in the Main and North ditches and the position of the rock determined as shown by the accompanying profile. From these borings, notes have also been made of the depths to gravel and other strata in the bottoms of the various ditches. No indication of rock is encountered east of the end of the ledge a few hundred feet east of the Inlet bridge. Beyond this point, all of the principal ditches have already been dug down to a sand or gravel subsoil, but in only one instance and that in the South ditch, is the sand encountered fine enough to cause any serious difficulty in the maintenance of the ditches. In establishing the grade lines of the various ditches, deep cutting in sand has been avoided so far as possible and where this has been necessary, the bottom width has been made great enough so that there should be no difficulty in keeping the channel open.

Following is a list of the present ditches showing the length to which they have been dug and are maintained at the expense of the district:

	Miles		Miles
Main Ditch	5.77	Forward	46.21
North "	13.06	Shippee Lateral	.70
South "	6.10	Cooper "	.66
Middle "	7.70	Nealis "	.34
Fourth "	4.57	Miller "	.61
Hicks Lateral	1.21	Nichols "	4.44
Frost "	1.95	Meridian "	1.00
Hart "	1.80	Hagadin "	.26
Weishaar "	.85	Ross "	.49
Wiener "	.30	McCausland "	.15
Ewald "	2.40	Richardson "	1.33
Piper "	.50	Willis "	.78
Forward	46.21	Total	56.97

The principal deficiencies of the drainage system as it now exists are as follows:

1 Frequent flooding of considerable portions of the district, especially of the flat area.

2 Long time necessary to unwater the flooded areas.

3 Insufficient outlet for the lands lying between the North and Fourth ditches; for those between the Fourth and Middle ditches, and those between the Middle and South ditches.

4 Scouring of Willow Creek and the upper portions of the Middle ditch, causing considerable damage to adjoining lands and depositing silt in the bed of the Middle and Main ditches.

5 Scouring of Sand Creek which reaches the district ditches through the Willis lateral and the silting of the South and Main ditches.

6 Scouring of the creeks leading into the Main ditch at various points west of Inlet and formation of rock and sand bars in the Main ditch.

A theoretical study of the drainage area and of the records of the climatic conditions which prevail in this section of the country, indicate that the present ditches, especially those in the central and lower portions of the district, are not of sufficient capacity to carry the surface water resulting from natural causes as fast as it reaches them and the actual conditions as they are found to exist, fully corroborate theory in this respect. In the

preparation of this report and the accompanying plans, all available data has been consulted, a survey of practically the entire district has been made and actual conditions as they have existed for several months, have been carefully studied. The above survey has made possible the construction of a contour map of a considerable portion of the drainage district and from this map, a number of valuable and interesting points have been developed. Among other things, it has been found that there are several hundred acres of land in the district which are at a lower level than the high water mark at Inlet. In fact, all of the flat area is in effect below this high water mark and is flooded at every extreme high water. The only exceptions to this are the few tracts that have been protected by levees.

While there is a fall in the natural surface of about two feet in crossing the flat area, the lands in the outer portions of this area are the ones that are most frequently flooded and from which it is most difficult to drain the water after they have been flooded. This overflow of the slightly higher lands is explained by the fact that in order to gain sufficient fall in the ditches crossing the flat area, they were necessarily dug comparatively deep near the outlet and much shallower near the outer edge of the flat area. In the steeper sections of the ditches which are found in the eastern part of the district, considerable scouring takes place and as the current strikes the lighter grades, sediment is deposited and the ditches are choked, this sedimentation taking place to the greatest extent in the very localities already having the shallowest ditches. The spreading out of the water over these lands first encountered in the flat area does, in many instances, furnish sufficient relief to the ditches so that the lower and deeper sections are able to carry the water reaching them without breaking out. After the water has subsided, following a general overflow of the flat area, the lands bordering the deeper sections of the ditches are drained much more promptly than those bordering the shallow portions as a better fall for small tributary ditches and tile is furnished.

No system of improvement which fails to effect the permanent lowering of the water surface in the Main ditch will give complete drainage to the lands above mentioned and this lowering of the actual outlet will improve the drainage of practically all of the lands of the district. By "actual outlet" is meant the water surface in the Main ditch, for it is evident that so long as the restriction in this ditch is such as to result in the present high water mark, this mark is the limit of available fall for draining the lands of the district at the times when drainage is most needed. This

lowering of the water in the Main ditch may be effected by; lowering the bed of the channel; widening the channel; or by a combination of the two. A comparison of the cost of the various plans shows that the desired capacity can be most economically secured by deepening the Main ditch from one to three feet as shown by the accompanying profile, and by increasing the width by a sufficient amount. It has been suggested that the lands of the district might be protected from overflow by the construction of a series of levees for the principal ditches with flood gates at the openings of all small ditches and tile drains. Such an arrangement would doubtless serve a considerable portion of the district but there are other portions which would not be benefited. An example of such would be the lands in sections 24 and 25 of Bradford township. With the drainage of these lands cut off during high water by a complete levee system, the water draining from about five thousand acres of tributary hill land would be concentrated on an area of less than eight hundred acres of these two sections with no chance of an outlet until after the recession of the water in the North ditch. A number of other methods have been suggested and studied but the levee system has been given some space in this for your consideration on account of its evident low first cost. It is not considered feasible however on account of the fact that it could not be so constructed as to give complete drainage to the entire district.

After giving due consideration to all suggested methods and figuring in detail the cost of at least three different combinations, it has been decided that the system of ditches as outlined in the following will prove to be the most economical and effective method for draining the district.

Beginning with the straightening of the channel of Green river below Binghampton, the present outlet should be widened and deepened throughout its entire length and this increase should be carried through the flat area on the North, Middle and South ditches. As a safeguard against floods from extreme high water, a system of low levees should be constructed along the shallowest portions of the North and Middle ditches for a distance of about two miles on each of these ditches. All tile and other openings through such levees should be protected by flood gates.

A short section of the North ditch should be relocated in section 32, Reynolds township, as shown by the accompanying map. This will correct the difficulty caused by the right angle bend on the north line of this section and the cross currents caused

by the Wiener lateral. It will also furnish a better outlet for the Ewald lateral.

In order to give a suitable outlet to the lands in the north-eastern portion of the district, the Cooper lateral should be extended one-fourth of a mile north. A line of tile would be suitable for this extension.

The Shippee lateral is difficult to maintain on account of continual filling with silt and this should be tiled for its entire length.

The Weiner lateral should be cleaned out and enlarged for its entire length in order to properly carry the water from tributary lands.

The natural drainage for the lands between the North and Fourth ditches is toward the west. Under the original plans of the district, it was the intention to drain these lands in to the North and Fourth ditches but experience has shown this to be impracticable and the laterals that have been dug for this purpose are of little benefit. A large tile should be laid in the swale about three-quarters of a mile north of the south line of Reynolds township running form a point in the west half of section 36, Reynolds township, west to the North ditch. An open ditch should also be constructed along the south side of the road between Viola and Reynolds townships beginning at the road running south in section 5, Willow Creek township, and running thence west to the North ditch.

The Nichols lateral is not of sufficient size to serve the tributary territory and under present conditions, has not sufficient fall. With the increased size and depth to be obtained in the North ditch, a proper outlet can be secured by extending this lateral west and discharging into the North ditch instead of into the Middle ditch as is done at present. The abrupt curves at the Meridian line should be replaced by easier curves and the lateral should be extended as an open ditch to the south quarter corner of section 9, Viola township. From this point, a tile extension should be constructed north-easterly to the center of section 10 of the same township.

The lower portion of the Middle ditch should be deepened and widened from its junction with the North ditch to the line betwween sections 15 and 16, Viola township, and the widening should be extended to the line between sections 14 and 15 of the same township.

Considerable injury has been done to the lands adjoining the upper portions of the Middle ditch due to the widening of

the ditch by erosion. Full plans have been prepared for the control of this ditch by the construction of a series of masonry drops but a comparison of the cost of such works with the cost of purchasing a reasonable amount of lands which have been and may be taken by the stream shows a large saving in favor of the latter plan. The fall in this part of the ditch amounts to from seven to ten feet to the mile and it is estimated that in order to fully prevent the widening of the channel by erosion, it would be necessary to reduce the effective fall to about five feet to the mile. It would not be practicable to effect this reduction with less than four structures as the channel is so shallow that a single high dam would permanently overflow a large area and without very extensive dykes, would cause the stream to leave its present bed and cut a new channel. A flight of four permanent drops, built over sheet pile cut off curtains (to prevent under cutting of the gravel foundation) and the construction of suitable levees to prevent the stream from cutting around the structures, would cost approximately $12,000. This control work was not contemplated in the estimates which follow but a sufficient amount has been included in the estimate of right of ways in order that the land owners may be fully reimbursed.

Points in the banks of this ditch which are especially exposed to the cutting action of the water, should be protected by piling and if necessary, by rip rap. Erosion by this stream will be much less serious in the future as it has widened its channel to such an extent that it has materially reduced the velocity of its current and its power to erode.

Along what is known as the "Town Line" road between Lee Center and Bradford townships and extending into Viola township, a new lateral should be constructed. This should be placed on the north side of the road in order to take advantage of a small ditch that has already heen constructed. This lateral should extend to the southeast corner of section 18, Viola township.

The South ditch should be cleaned out and enlarged from its junction with the North ditch to the angle near the south quarter corner of section 20, Viola township.

In order to avoid the deep sand cut in the southeast quarter of section 20, Viola, and to better serve the low lands to the north of the present ditch, a new cut-off ditch should be constructed beginning at the intersection of the South ditch with the Third Principal Meridian and running northeasterly as shown by the accompanying map, to an intersection with the South ditch in the northwest quarter of section 20, Viola township. From this

point northeasterly and easterly, the South ditch and Hagadin lateral should be enlarged and extended to the intersection of the north line of section 22, Viola township, with the creek running northwesterly through the northeast quarter of said section 22.

In order to prevent the flooding of lands adjacent to the McCausland lateral, this should be cleaned out and low levees constructed for a short distance south from the South ditch.

The Richardson lateral has become obstructed by a considerable amount of sediment and should be cleaned out in order to properly drain the tributary lands.

The Willis lateral should be deepened and widened to serve as a settling basin to catch the sand discharged by the Sand creek. To prevent erosion at the head of this lateral, due to the increased head, a masonry drop should be constructed.

A new tile lateral should be constructed along the west side of the highway in the west half of section 35, Bradford township, from the intersection of this road with the North ditch north to the north line of said section 35. This lateral is referred to herein as the Henry lateral.

The Frost lateral has become obstructed by sediment and should be cleaned out.

The lands draining into the upper portion of the Hicks lateral would be better served by replacing the open ditch with a large tile and this should be done in order to reduce future maintenance expense.

In all of the construction and repair work as outlined in the foregoing, precautions should be taken to prevent sedimentation of the ditches by the smaller tributaries. Until conditions have become adjusted after the deepening of the principal ditches, there will be an increased tendency to erode by the smaller streams on account of the greater fall at their outlets. This can be largely overcome by cutting an easy grade line back into these smaller creeks and laterals at the time that the main work is being done. By cutting out a small basin at the entrance of these smaller streams, the resulting silt will have tendency to deposit in these basins rather than in the principal ditch. In the case of the Lee Center creek and the Willis lateral, this should be supplemented by low masonry dams or "drops." These drops should be placed far enough back from the larger stream to allow the deposit of sand to be made in the small channel.

An effort should be made to let a contract to cover all of the above work. It is quite probable, however, that some of the smaller and more isolated jobs will not be attractive to bidders

and they will not bid on these at a reasonable price. In order to be able to construct these small laterals at a reasonable expense and to take care of future maintenance in the most economical manner, the district should purchase a small land dredge.

For the purpose of preparing a detailed estimate of the cost of the work recommended in the foregoing, this has been divided into sections which are given in the following together with the estimated cost and description of each section:

Sec. No. 1	Construction of a new ditch from a point in the Green river southwesterly from the C. B. & Q. railway tracks northeasterly to the northeasterly boundary line of the right of way as shown by the accompanying map.		
	Distance 0.09 miles. Base 90 feet.		
	9,000 cu. yds. common material @ 20c	$1,800	
	Change of the C. B. & Q. railway bridge	$1,200	$ 3,000
2	Construction of a short section of new ditch from the end of section 1 to Kreiter's Mill at Binghampton and the reconstruction of the present Main ditch from Kreiter's mill to the junction of the Lee Center creek.		
	Distance 3.17 miles. Base of new work 90 feet, base of ditch above Kreiter's mill 80 feet.		
	281,740 cu. yds. common material @ 12½c	$35,217	
	135,000 cu. yds. rock @ 90c	$121,500	
	Replacing of Binghampton highway bridge with new 100 ft. span	$1,500	
	Extras—Excavation of silt basins at junction of small creeks	$1,400	159,617
3	Reconstruction of the Main ditch from the end of section 2 to the end of the rock above Inlet.		
	Distance 1.19 miles. Base 70 feet.		
	123,040 cu. yds. common material @ 12½c	$15,380	
	54,550 cu. yds. rock @ 90c	$49,095	64,475
4	Reconstruction of the Main ditch from the end of section 3 to the head of the ditch at the junction of the North and South ditches.		
	Distance 1.59 miles. Base 70 feet.		
	219,400 cu. yds. common material @ 11c		24,134
5	Reconstruction of the North ditch from the end of section 4 to the Middle ditch.		
	Distance 1.70 miles. Base 46 feet.		
	129,400 cu. yds. @ 11c		14,234

6 Reconstruction of the North ditch from the end of section 5 to the Fourth ditch.

Distance 2.36 miles. Base 30 feet.

91,200 cu. yds. @ 11c	$10,032	
Extras—Levee construction	150	$10,182

7 Reconstruction of the North ditch from the end of section 6 to the Ewald lateral. This will include the new cut-off ditch as recommended in section 32 of Reynolds township.

Distance 2.82 miles. Base 24 feet.

99,300 cu. yds. common material @ 11c	$10,923	
Extras—Levee construction	600	11,523

8 Substitution of tile for the open ditch for the entire length of the Shippee lateral.

0.70 mile of 15 inch tile @ $1690	$1,183	
Head wall and catch basin	66	1,249

9 Tile extension of the Cooper lateral from the present head of this lateral one-fourth of a mile north to the center of the west one-half of section 29, Reynolds township.

0.25 mile of 15 inch tile @ $2200	$550	
Head wall and catch basin	66	616

10 Reconstruction of the Wiener lateral for its entire length.

Distance 0.30 mile. Base 12 feet.

3,600 cu. yds. excavation @ 15c		540

11 Construction of a new tile lateral in the south tier of sections in Reynolds township. This is referred to herein as the Beach lateral and should follow the swale in the northern part of these sections from an intersection with the North ditch (or the North ditch cut-off if constructed as recommended herein) to the north and south center line of the west half of section 36, Reynolds township. From the North ditch to the Miller lateral, this should be laid with 18 inch tile, the remainder being 15 inch tile.

Total length 3.40 miles.

1.15 miles of 18 inch tile @ $2900	$3,335	
2.25 miles of 15 inch tile @ $2200	4,950	
Head wall, catch basins and other special work	350	8,635

12 Construction of a new ditch along the south side of the road between Reynolds and Viola townships as herein recommended.

Distance 5.56 miles. Base 4 feet.
133,600 cu. yds. @ 12½c $16,700

13 Reconstruction and extension of open ditch portion of the Nichols lateral as herein recommended.
Length 3.22 miles.
Base 4 feet.
38,100 cu. yds. common material @ 12½c $4,763 4,763

14 Tile extension of the Nichols lateral to the center of section 10, Viola township, as herein recommended
1.14 miles of 15 inch tile @ $2200 $2,508
Head wall and catch basins 100 2,608

15 Cleaning out and enlarging the lower portion of the Middle ditch from its junction with the North ditch to the line between sections 14 and 15, Viola township
Distance 5.06 miles. Base 26 feet
138,000 cubic yds. common material @ 11c $15,180
Extras—Levee construction 800 15,980

16 Protection of banks in the upper portion of the Middle ditch. This work will be found scattered from section 16, Viola, to the head of the ditch but the most will be required in sections 12 and 14, Viola and section 7, Willow Creek township, Total estimated cost. 1,000

17 Construction of a new lateral west from the intersection of the North ditch with the line between Lee Center and Bradford townships, to the southeast corner of section 18, Viola township. This new lateral is referred to herein as the Kane lateral.
Distance 3.00 miles. Base 4 feet.
64,100 cu. yds. common material @ 12½c $8,012 8,012

18 Cleaning out and enlarging the lower portion of the South ditch from its junction with the North ditch to the angle near the south quarter corner of section 20, Viola township.
Distance 4.16 miles. Base from North ditch to the Willis lateral, 20 feet, from Willis lateral to the Meridian line, 16 feet, and the remainder of the section, 12 feet.
81,940 cu. yds. @ 11c $9,013

19 Construction of a new cut-off for the South ditch from its intersection with the Third Principal 9,031

Meridian, northeasterly to a point in the South ditch near the center of the northwest quarter of section 21, Viola township. This section will also include the cleaning out and enlarging of the South ditch and the Hagadin lateral from the last point above mentioned, and the extension of the Hagadin lateral east to an intersection with a creek in the northeast quarter of section 22, Viola township.

Distance 4.12 miles. Base from the Meridian line to the junction with a creek in the northeast quarter of section 21, Viola township, 12 feet. Balance of this section to have a base width of 8 feet.

	76,870 cu. yds. common material @ 12½c	$9,609	$9,609
20	Cleaning out and repairing the McCausland lateral and construction of low levees along this lateral.		
	3,200 cu. yds. common material @ 15c	$480	480
21	Cleaning out and repairing of the Richardson lateral.		
	6,270 cu. yds. common material @ 15 c	$940	940
22	Reconstruction of the Willis lateral. Distance 0.78 miles. Base 16 feet.		
	34,250 cu. yds. common material @ 11c	$3,767	3,767
23	Construction of a new tile lateral, herein referred to as the Henry lateral in section 35, Bradford township.		
	0.68 mile of 15 inch tile @ $2200	$1,496	
	Head wall and catch basin	66	1,562
24	Cleaning out and repairing the Frost lateral.		
	6,500 cu. yds. common material @ 15c	$975	975
25	Substitution of tile for the open ditch in the upper portion of the Hicks lateral.		
	0.52 mile of 15 inch tile @ $2200	$1,144	
	Head wall and catch basin	66	1,210
26	Construction of a masonry barrier in the Lee Center creek to prevent erosion in that creek and consequent sedimentation in the Main ditch		2,500
27	Construction of a masonry barrier in the upper end of the Willis lateral. (Similar to above)		2,500
28	Construction of 15 permanent automatic flood gates in connection with levees to be constructed on the North and Middle ditches at $225 each		3,375

SUMMARY OF ESTIMATES

Sec. No.		
1	Main ditch	$ 3,000
2	Main ditch	159,617
3	Main ditch	64,475
4	Main ditch	24,134
5	North ditch	14,234
6	North ditch	10,182
7	North ditch	11,523
8	Shippee lateral	1,249
9	Cooper lateral	616
10	Wiener lateral	540
11	Beach lateral	8,635
12	Town Line lateral	16,700
13	Nichols lateral	4,763
14	Nichols lateral	2,680
15	Middle ditch	15,980
16	Middle ditch	1,000
17	Kane lateral	8,012
18	South ditch	9,013
19	South ditch cut-off	9,609
20	McCausland lateral	480
21	Richardson lateral	940
22	Willis lateral	3,767
23	Henry lateral	1,562
24	Frost lateral	975
25	Hicks lateral	1,210
26	Barrier in the Willis lateral	2,500
27	Barrier in the Lee Center creek	2,500
28	Flood gates	3,375
	Total of construction items	383,199
	Cost of dredge complete as recommended	4,000
	Right of ways and land damages	28,500
	Incidental expenses, engineering and supervision	15,000
	Total estimated expense	$430,699
	Average cost per acre (30,299 acres)	$14.37

The foregoing estimates of material to be excavated are based on ditches with side slopes of one foot horizontal to one foot vertical with the exception of the laterals having a base width of six feet or less. These smaller laterals are to have side slopes of one and one-half foot horizontal to one foot vertical.

It is a difficult matter to make a comparison of the benefits to be derived from the work recommended by making a comparison of the selling price of the lands of the district with those outside as this price depends largely on improvements, conditions of sale, value of other lands which may be given in exchange, and other matters which are difficult to take into consideration in an investigation of this nature. A comparison of the cash rents which may be secured from similar lands which are drained will give a better idea of the benefits to be derived. Assuming $3.50 per acre to be a fair estimate of the renting value of such average lands within the district under present conditions, and $5.25 per acre to be the renting value of the same lands after proper drainage outlets have been provided, this shows a net increase in revenue per acre of $1.75 which, capitalized at five per cent, represents an increase in value per acre of $35.00, or an increase in the value of the lands of the district of $1,060,465.

The lowering of the Main ditch and other waterways of the district will result in a general re-adjustment of the grades of practically all of the streams of the drainage area and will cause more or less sedimentation of the principal ditches from the smaller streams. This should be watched, especially for the first few years, by the commissioners, but by exercising proper care and correcting such defects as they arise, the system may be kept in good working condition at all times and at a nominal expense. The grades of all work herein recommended have been so placed that after this re-adjustment has taken place, there will be much less difficulty from bars in the principal ditches than heretofore. A small maintenance fund should be available however at all times in order that repairs may be made promptly when the occasion arises.

One cause of injury to the ditches under present conditions arises from the careless manner in which tile and other openings are made in the embankments. Such work should be subject to the supervision of the Commissioners of the district who should insist that a suitable box should be used in passing the drains under embankments or that a permanent head wall should be erected at the outlet and the tile leading through the embankment

should be laid in cement. In either case, the back filling should be carefully done and the dirt well rammed in place.

While no especial investigation has been made in the matter and it is doubtless not within the province of the Commissioners to regulate, it has been noted in a number of instances that farm tile systems have been laid without due regard to the slope of the land and available outlets. This is doubtless due to the incompetency of those in charge of the work. It has resulted in the expenditure of considerable sums of money from which little or no benefit has been derived.

In the preparation of the foregoing plans, an effort has been made to outline a system which will provide outlets for the complete drainage of the lands of the district under all ordinary and nearly all extraordinary conditions. The fact must be recognized however, that there may come a storm, possibly once in a generation, which will cause material damage to some of the lands of the district. Such floods do occur at times, even in hilly lands and to make absolute provision against them would entail a greater expense than would be justified by the benefits derived.

Careful consideration has been given to all of the engineering features of the system and to such practical matters as have come to our notice. It is probable however, that a number of minor points have been omitted in this report, but as these will depend more on an intimate knowledge of the district and of local conditions than on engineering principles, it has been considered that the Commissioners are in a better position to make recommendations in regard to them than are the engineers.

Respectfully submitted,

A. M. Shaw,
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J. M. Egan, Jr.,
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Dixon, Ill., May 16, 1908.

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